

INCH-POUND

MIL-PRF-1/1612A(NAVY)
4 September 1998
SUPERSEDING
MIL-E-1/1612(NAVY)
5 May 1966

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, GAS
TYPE 7620

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tube described herein shall consist of this document and the latest issue of MIL-PRF-1.

DESCRIPTION: Ceramic-metal hydrogen thyatron with reservoir.

Dimensions and connections: See figure 1.

Mounting position: Any.

Mounting arrangement: Cathode flange.

ABSOLUTE MAXIMUM RATINGS:

| Parameter: | Ef | Eres | epy | epx | Ebb | egy | egx | Ecc | $\frac{dik}{dt}$ |
|-----------------|---------------------|---------------------|------------------|--------------------------------|-------|---------------------|-----|------|------------------|
| Unit: | V ac | V ac | kv | kv | V dc | v | v | V dc | a/ μ s |
| Maximum | 6.8 $\frac{6}{5.8}$ | 6.8 $\frac{6}{5.8}$ | 20 $\frac{1}{2}$ | 20 $\frac{2}{5\% \text{ epy}}$ | --- | 600 $\frac{3}{200}$ | 200 | 200 | 2,000 |
| Minimum | 5.8 | 5.8 | 2 | 5% epy | 1,250 | 200 | --- | --- | --- |
| Test condition: | 6.3 | 6.3 | --- | --- | --- | 180 | --- | 0 | --- |

ABSOLUTE MAXIMUM RATINGS:

| Parameter: | ib | Ip | Ib | tk | pr | Pb | tj | TA | Cooling |
|-----------------|-----|------------------|-----|-----|-------|------------------|----------------|------|----------------|
| Unit: | a | Aac | Adc | sec | pps | $\frac{5}{\mu}$ | μ s | °C | |
| Maximum | 500 | 8 $\frac{4}{---$ | 0.5 | --- | --- | 10×10^9 | .005 | +125 | $\frac{5}{---$ |
| Minimum | --- | --- | --- | 180 | --- | --- | $\frac{7}{---$ | -55 | --- |
| Test condition: | --- | --- | --- | 180 | 2,500 | --- | --- | Amb. | --- |

GENERAL:

Qualification - Not required.

Holding period: t = 96 hours (minimum).

TABLE I. Testing and inspection.

| Inspection | Method or paragraph | Conditions | Symbol | Limits | | Unit |
|--|---------------------------|--|--------|--------|-------|------|
| | | | | Min | Max | |
| <u>Conformance inspection, part 1</u> | | | | | | |
| Visual and mechanical inspection criteria | App D, 20(a) | | | | | |
| DC Instantaneous starting | 3267 | epy = 16 kv: Ef = Eres = 6.8 V ac <u>9/ 10/</u> | --- | --- | --- | --- |
| Operation (1) | --- | epy = 20 kv (min); Ef = Eres = 5.8 V ac <u>9/ 12/ 13/</u> | egy | --- | 180 | v |
| Anode delay time | 3256 | Operation (1) t = 120 | tad | --- | 0.50 | μs |
| Anode delay time drift | 3256 | Anode delay time <u>14/</u> | Δtad | --- | 0.10 | μs |
| Critical anode voltage for conduction | 3246 | Ef = Eres = 5.8 V ac <u>9/ 11/</u> | Ebb | --- | 1,000 | V dc |
| Emission | 3251 | ik = 500 a <u>17/</u> | egk | --- | 175 | v |
| <u>Conformance inspection, part 2</u> | | | | | | |
| Time jitter | 3261 | Operation (1) <u>15/</u> | tj | --- | 0.005 | μs |
| Operation (1A) | --- | Operation (1) Ef = Eres = 6.8 V ac tk = 180 sec <u>12/</u> | egy | --- | 180 | v |
| Cathode heater current | 3241 | --- | If | 5.5 | 7.5 | Aac |
| Reservoir heater current | 3241 | --- | Ires | 1.0 | 4.0 | Aac |
| <u>Conformance inspection, part 3</u> | | | | | | |
| Life-test provisions | 4.7 | Group C; epy = 20 kv <u>9/ 18/</u> Ef = Eres = 6.3 V ac | t | 1,000 | --- | hrs |
| Life-test end points | 4.7.3 | Operation (1) egy = 200 v (max) | --- | --- | --- | --- |
| | | Critical anode voltage for conduction egy = 200 v (max) | Ebb | --- | 1,250 | V dc |
| | | Anode delay time egy = 200 v (max); Ef = Eres = 6.3 V ac | tad | --- | 0.6 | μs |

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

| Inspection | Method or paragraph | Conditions | Symbol | Limits | | Unit |
|-------------------------------------|---------------------|--|------------------|-------------------|----------------------|----------------------|
| | | | | Min | Max | |
| <u>Periodic check tests</u> | 4.1.1.2 | | | | | |
| Variable-frequency vibration | 1031 | No voltage applied <u>8/</u> (10-250 Hz) | | | | |
| Shock | --- | 100 g <u>19/</u> | | | | |
| Post vibration and shock end points | --- | Operation (1) DC anode voltage Time jitter | egy Ebb tj | --- --- --- | 200 1,250 .005 | v V dc μ s |
| Operation (2) | --- | TA = +125°C t = 5 hours <u>9/ 16/</u> | egy | --- | 180 | v |

- 1/ Instantaneous starting is permissible. The maximum permissible instantaneously applied epy shall be 16 kv and shall not be attained in less than 0.04 second. Epy may then be raised to full rating.
- 2/ In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05 μ s maximum duration, shall not exceed 5 kv during the first 25 μ s following the anode pulse.
- 3/ The driver pulse, measured at tube socket with thyatron grid disconnected: amplitude per ratings; tr = 0.35 μ s (max); tp = 2 μ s (min); Zg = 250 to 500 ohms. At -55°C, 250 V (min) is required.
- 4/ For hydrogen thyatron applications Ip shall be computed as the square root of the product of Ib x ib.
- 5/ A cooling air blast of 10 cfm may be directed into the anode cup when operating at maximum anode dissipation.
- 6/ The optimum heater voltages for operation in accordance with Operation (1) conditions is 6.3 V ac and shall be held to within ± 7.5 percent. Applications involving other operating conditions may necessitate redetermination of the optimum reservoir voltage.
- 7/ Appreciably less jitter than 0.005 μ s can be realized: If the anode voltage is 8 kv or more; the grid drive amplitude is near the maximum and the grid drive impedance is near minimum.
- 8/ There shall be no pronounced resonance in the range from 10 to 250 Hz when the tube is mounted by the cathode flange.
- 9/ The tube shall be tested in the test circuit shown on figure 2. Tests performed at repetition rates less than the resonant rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen under resonant charging conditions so that:

$$\text{epy} = 20 \text{ kv}; \text{ib} = 200 \text{ a (min)}; \frac{dik}{dt} = 2,000 \text{ a}/\mu\text{s (min)}; \text{tp} = 0.6 \mu\text{s} \pm 10 \text{ percent}; \text{pr} = 2,500 \text{ pps (min)}.$$

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltage and repetition rates for each test are specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

Grid pulse as measured at tube socket with thyatron grid disconnected shall have the following characteristics: tr = 0.35 μ s (min); tp = 2 μ s (max). The internal impedance of driver shall be 500 ohms minimum.

TABLE I. Testing and inspection - Continued.

- 10/ This test shall be the first test performed after the holding period. The tube shall operate satisfactorily on push-button starting within three attempts when the anode voltage (epy) is applied to the tube under test in such a manner as to rise from 0 to 16 kv minimum within 0.03 second. (The filter in the rectifier shall be designed so that the epy reaches at least 8 kv within 0.015 second.) The intervals between successive attempts to instantaneously start the tube shall be not less than 10 nor more than 30 seconds. Any tube failing to start within three attempts shall be considered a failure.
- 11/ This test shall be conducted within 60 seconds of the Operation (1) test.
- 12/ The tube shall operate continuously for 10 minutes.
- 13/ There shall be no evidence of arcbreak or detrimental anode heating during this test.
- 14/ This test shall be performed simultaneously with the Operation (1) test. An anode delay time measurement shall be made at the end of 2 and 7 minutes of the Operation (1) test. The anode delay time drift measurement is the numerical difference between the 2 minute and 7 minute anode delay time readings. The change in anode delay time (with respect to the 2 minute reading) shall not exceed the value specified herein.
- 15/ The tube shall be tested by applying a peak forward anode voltage not to exceed that specified in the test conditions for the time jitter test immediately after the cathode warm-up period (tk). The variation in firing time (tj) shall not be greater than the amount specified herein after 120 seconds of operation.
- 16/ This test shall be conducted for a total of 5 consecutive hours with no more than 3 kickouts and with no evidence of detrimental anode heating. The tube shall be started with $E_f = E_{res} = 6.8 \text{ V ac}$ and operate at this value for 4 hours. At the start of the 5th hour and while the tube is still operating, the filament voltage shall be lowered to $E_f = E_{res} = 5.8 \text{ V ac}$ and remain there for the final hour of operation.
- 17/ The positive pulse shall be applied to the grid. The voltage between grid and cathode shall be measured not more than $2.5 \mu\text{s}$ after the beginning of the current pulse. The average voltage shall not increase after the voltage measurement point.
- $t_p = 5.0 \mu\text{s} \pm 10 \text{ percent}$; $t_r = 0.5 \mu\text{s} (\text{max})$; $prr = 60 \text{ pps} \pm 10 \text{ percent}$.
- 18/ Where production is less than 50 tubes per month, one tube shall be tested of each 50 produced. When one month's production is more than 50 tubes but less than 250 tubes, the following sampling procedure shall be used:
- | | |
|-----------|-----------|
| $n_1 = 2$ | $c_1 = 0$ |
| $n_2 = 2$ | $c_2 = 1$ |
- except that $c_1 = 1$ if the first sample from the preceding lot contained no defectives.
- 19/ The shock test shall be performed in accordance with MIL-STD-202, method 213, test condition I. Each tube shall be subjected to a total of 15 shock pulses; that is, five in each of axis X, Y, and Z in any sequence. A tube which does not comply with the post shock limits shall be considered a failure.

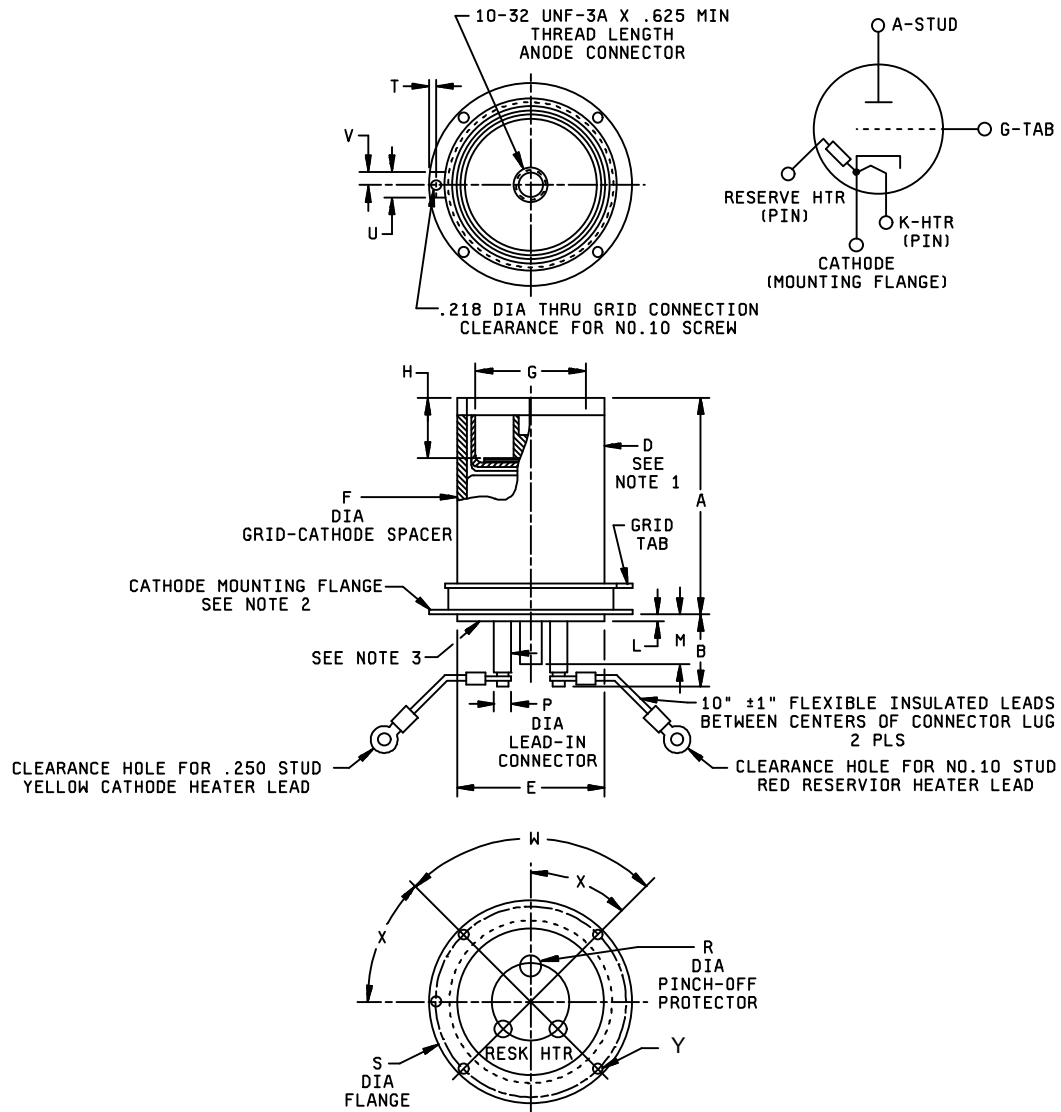


FIGURE 1. Outline drawing of electron tube type 7620

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| Ltr | Dimensions | | | |
|-----|---|-----------|--|-----------|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | 3.370 | 3.625 | 85.60 | 92.07 |
| B | --- | 1.340 | --- | 35.56 |
| D | 1.965 DIA | 2.040 DIA | 49.91 DIA | 51.82 DIA |
| E | 1.965 DIA | 2.040 DIA | 49.91 DIA | 51.82 DIA |
| F | 2.215 DIA | 2.290 DIA | 56.26 DIA | 58.17 DIA |
| G | 1.560 DIA | 1.680 DIA | 39.62 DIA | 42.67 DIA |
| H | .965 | 1.085 | 24.51 | 27.56 |
| L | .050 | .145 | 1.27 | 3.68 |
| M | --- | 1.085 | --- | 27.56 |
| P | --- | .375 DIA | --- | 9.53 DIA |
| R | --- | .469 DIA | --- | 11.91 DIA |
| S | 3.200 | 3.300 | 81.28 | 83.82 |
| T | --- | .25 | --- | 6.35 |
| U | --- | .50 | --- | 12.70 |
| V | --- | .25 | --- | 6.35 |
| W | 90° TYP | | 90° TYP | |
| X | 45° NOM | | 45° NOM | |
| Y | .188 DIA THRU-4 HOLES ON A 2.75 DIA B.C. | | 4.78 DIA THRU-4 HOLES ON A 69.85 DIA B.C. | |

NOTES:

1. Do not use metal clamps on ceramic envelope.
2. Reservoir and cathode-heater have one side tied to cathode. Pinch-off assembly is electrically connected to cathode.
3. This part may be metal disc with ceramic back up ring or a ceramic disc. When a metal disc is used, connections are made to ceramic metal feed-throughs.

FIGURE 1. Outline drawing of electron tube type 7620 - Continued.

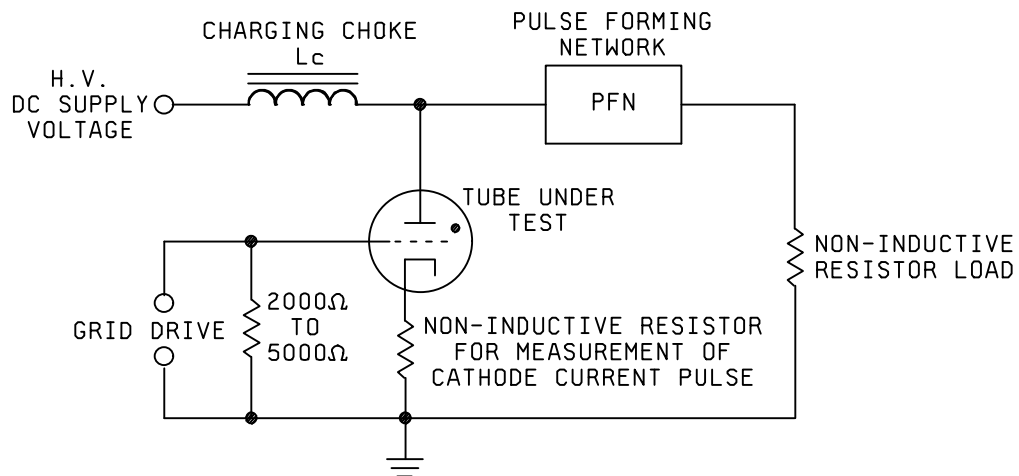


FIGURE 2. Test circuit.

Custodians:
Navy - EC

Review activities:
Nave - CG, MC

Preparing activity:
DLA - CC

(Project 5960-N241)